

AUTOMOTIVE: ENGINE PERFORMANCE

COURSE DESCRIPTION

Automotive: Engine Performance is a course that prepares students for entry-level positions or advanced training in engine performance. The course covers electronic ignition and distributor ignition systems, fuel management, exhaust emission control, and computer input and output signals and will identify the different types of sensors used by automotive engine computers. Students will perform inspections, tests, and measurements for diagnosis and perform needed repairs. Education and experiences simulate automotive service industry operations through the use of training aids and modules and offer school-based learning opportunities.

Course content prepares students for the Automotive Service Excellence (ASE) Engine Performance test.

Prerequisite(s): Automotive: Electronics Systems; Algebra I or Math for Technology II; Physical Science or Principles of Technology I

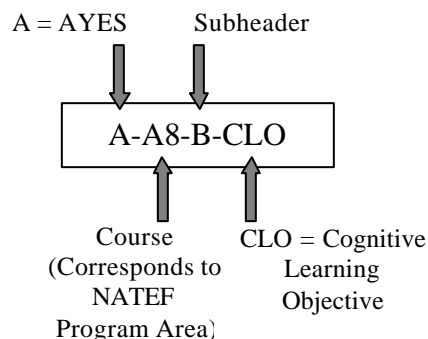
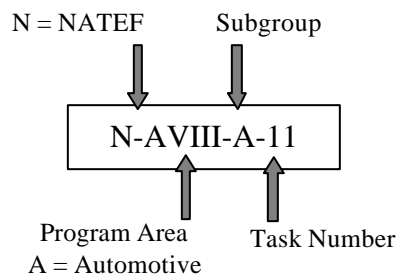
Requirement: A minimum of 250 hours must be dedicated to engine performance to meet minimum standards set by NATEF.

Recommended Credits: 2

Recommended Grade Level(s): 11-12

Note: Course is aligned with NATEF task list for Automotive: Engine Performance. Items have been organized based on requirements of Tennessee required course description format.

Engine Performance



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| AUTOMOTIVE: ENGINE PERFORMANCE STANDARDS |
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- 1.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 2.0 Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.
- 3.0 Students will apply fundamental mathematical and science concepts to automotive engine performance technology.
- 4.0 Students will properly test, diagnose, and service automotive engines.
- 5.0 Students will properly test, diagnose, service, and repair fuel delivery systems.
- 6.0 Students will properly test, diagnose, service, and repair emission systems.
- 7.0 Students will properly test, diagnose, service, and repair ignition systems.
- 8.0 Students will properly test, diagnose, service, and replace computerized engine controls.
- 9.0 Students will demonstrate communication skills required in the automotive service industry.
- 10.0 Students will demonstrate interpersonal and employability skills required in the automotive services industry.

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 1.1 Demonstrate positive leadership skills in the classroom and community.
- 1.2 Participate in SkillsUSA-VICA as an integral part of classroom instruction.
- 1.3 Investigate how technology has made an impact on engine performance in the past 2 years.
- 1.4 Construct a job search network.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 1.1 Serves as a volunteer in the community.
- 1.2.A Applies the points of the creed to personal and professional situations.
- 1.2.B Assists with an officer campaign with Tennessee SkillsUSA-VICA.
- 1.3.A Writes a technical report that shows technological advancements in engine performance.
- 1.4.A Refines employment portfolio.
- 1.4.B Completes a job search for employment opportunities.
- 1.4.C Researches job search opportunities through SkillsUSA-VICA.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA-VICA programs and/or competitive events.
- Analyze entry-level job skills and demonstrate proficiency in each skill.
- Implement an annual program of work.
- Attend a professional organization meeting.
- Participate in the Community Service competition with SkillsUSA-VICA.
- Places resume on national job search website with SkillsUSA-VICA at www.skillsusa.org.

INTEGRATION LINKAGES

SkillsUSA-VICA, *Professional Development Program*, SkillsUSA-VICA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 2.0

Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

LEARNING EXPECTATIONS

The student will:

- 2.1 Determine the safe and correct application and disposal for chemicals used in an automotive repair facility.
- 2.2 Use protective clothing, eye protection, and safety equipment.
- 2.3 Use fire protection equipment.
- 2.4 Follow OSHA and EPA regulations affecting engine performance service technology.
- 2.5 Respond to manufacturer safety communications concerning engine performance systems and components.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1.A Conforms to federal, state, and local regulations when handling, storing, and disposing of chemicals.
- 2.1.B Ensures proper ventilation for chemical use.
- 2.1.C Locates first aid supplies.
- 2.2.A Demonstrates proper usage of special safety equipment used in performing engine performance servicing.
- 2.2.B Selects and uses the appropriate protective clothing for a given task.
- 2.2.C Demonstrates the use of eye protection.
- 2.3.A Distinguishes the proper fire extinguisher for each class of fire.
- 2.3.B Demonstrates the proper use of a fire extinguisher and other fire protection equipment.
- 2.4.A Locates regulatory information.
- 2.4.B Extracts information from Material Safety Data Sheets.
- 2.4.C Complies with relevant regulations and standards.
- 2.4.D Passes with 100% accuracy a written examination relating specifically to engine performance safety issues.
- 2.4.E Passes with 100% accuracy a performance examination relating specifically to engine performance tools and equipment.
- 2.4.F Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.
- 2.5.A Interprets manufacturer safety and recall communications.
- 2.5.B Complies with safety signs and symbols.

SAMPLE PERFORMANCE TASKS

- Assess the work area for safety hazards.
- Design a corrections program for identified hazards.
- Model the appropriate protective equipment for an assigned task.

INTEGRATION LINKAGES

Math, Science, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Secretary's Commission on Achieving Necessary Skills (SCANS), National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA-VICA, AYES Curriculum.

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 3.0

Students will apply fundamental mathematical and science concepts to automotive engine performance technology.

LEARNING EXPECTATIONS

The student will:

- 3.1 Examine how mathematics and physics concepts and laws apply to automotive engine performance.
- 3.2 Analyze the functions and operation of automotive engines and fuel systems.
- 3.3 Analyze the functions and operation of automotive ignition systems and emission systems.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1.A Correlates the following concepts with their role in automotive engines: A-A8-1-CLO
 - hydrocarbon combustion
 - energy
 - heat
 - temperature
 - pressure
 - speed
 - work
 - torque
 - horsepower
- 3.1.B Explores the thermal expansion of fluids and solids. A-A8-1-CLO
- 3.1.C Differentiates between volumetric and mass efficiency. A-A8-1-CLO
- 3.1.D Illustrates how motion converts to heat energy.
- 3.1.E Relates atmospheric pressure to the term vacuum. A-A8-1-CLO
- 3.1.F Determines how Boyle's law of constant temperature and Charles's law of constant volume apply to automotive engine performance. A-A8-1-CLO
- 3.2.A Differentiates between bore, stroke, and displacement. A-A8-1-CLO
- 3.2.B Calculates engine compression ratio. A-A8-1-CLO
- 3.2.C Illustrates the Otto or four-stroke cycle of operation. A-A8-1-CLO
- 3.2.D Analyzes the operation of the primary fuel system, including fuel tank, pumps, filters, fittings, and lines. A-A8-1-CLO
- 3.2.E Analyzes the operation of an electronic fuel injection system, including speed density, mass airflow, airflow meter, throttle bodies, idle controls, and injectors. A-A8-1-CLO
- 3.3.A Distinguishes between the different types of emission systems and illustrates their operation. A-A8-3-CLO
- 3.3.B Distinguishes between the different types of catalytic converters and illustrates their operation. A-A8-3-CLO
- 3.3.C Analyzes the operation of distributor and distributorless ignition systems and components. A-A8-5-CLO

SAMPLE PERFORMANCE TASKS

- Calculate engine compression ratio.
- Diagram the following systems and identify the forces and principles at work in the operation of each:
 - primary fuel system
 - electronic fuel injection system
 - exhaust system
 - ignition system

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 4.0

Students will properly test, diagnose, and service automotive engines.

LEARNING EXPECTATIONS

The student will:

- 4.1 Inspect and test engine mechanical, electrical, electronic, fuel, and ignition systems.
- 4.2 Diagnose engine mechanical, electrical, electronic, fuel, and ignition problems and determine necessary action.
- 4.3 Service and repair automotive engine mechanical, electrical, electronic, fuel, and ignition systems.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1.A Inspects engine assembly for fuel, oil, and coolant levels and leaks. N-AV111-A-2
- 4.1.B Performs engine absolute manifold pressure tests and determines necessary action. N-AV111-A-5
- 4.1.C Performs cylinder tests including power balance tests, compression tests, and/or leakage tests, and determines necessary action. N-AV111-A-6, N-AV111-A-7, N-AV111-A-8
- 4.1.D Performs cooling system pressure tests; checks coolant condition; and inspects and tests radiator, pressure cap, coolant recovery tank, and hoses. N-AV111-F-4
- 4.1.E Inspects and tests thermostat, by-pass, and housing. N-AV111-F-5
- 4.1.F Inspects and tests mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices. N-AV111-F-6
- 4.1.G Develops a strategy for engine diagnosis. N-A8-ICS, N-AV111-4-1
- 4.2.A Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs relating to engine performance.
- 4.2.B Uses oscilloscope and/or engine diagnostic equipment to diagnose mechanical, electrical, electronic, fuel, and ignition problems. N-AV111-A-9
- 4.2.C Diagnoses unusual engine noise or vibration problems and determines necessary action. N-AV111-3
- 4.2.D Verifies correct camshaft timing and determines necessary action. N-AV111-F-2
- 4.2.E Verifies correct engine-operating temperature and determines necessary action. N-AV111-F-3
- 4.3.A Adjusts fuel, oil, and coolant levels and repairs leaks. N-AV111-A-2
- 4.3.B Adjusts valves on engines with mechanical or hydraulic lifters. N-AV111-F-1
- 4.3.C Performs needed service or repair determined by cooling system pressure tests; coolant condition checks; and tests and inspections of radiator, pressure cap, coolant recovery tank, and hoses. N-AV111-F-4

- 4.3.D Performs repairs indicated by inspection and testing of thermostat, by-pass, and housing. N-AV111-F-5
- 4.3.E Performs repairs indicated by inspection and testing of mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices. N-AV111-F-6

SAMPLE PERFORMANCE TASKS

- Diagnose a customer complaint about engine noise.
- Repair coolant leak.
- Use an oscilloscope to diagnose a performance problem.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 5.0

Students will properly test, diagnose, service, and repair fuel delivery systems.

LEARNING EXPECTATIONS

The student will:

- 5.1 Inspect and test fuel delivery systems and components.
- 5.2 Diagnose fuel delivery system problems and determine necessary action.
- 5.3 Service and repair fuel delivery systems and components.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1.A Inspects fuel tank, fuel cap, fuel lines, fittings, and hoses; and inspects and tests fuel injectors. N-AV111-D-3
- 5.1.B Checks fuel for contaminants and quality. N-AV111-D-4
- 5.1.C Inspects and tests the following:
 - mechanical and electrical fuel pumps and pump control systems including pressure regulators, N-AV111-D-5
 - fuel pressure regulation systems, N-AV111-D-7 and
 - components of injection type fuel systems. N-AV111-D-7
 - operation of turbocharger/supercharger. N-AV111-D-17
- 5.1.D Inspects throttle body mounting plates, air induction and filtration system, intake manifold, and gaskets. N-AV111-D-11
- 5.1.E Checks idle speed and fuel mixture. N-AV111-D-12
- 5.1.F Removes, inspects, and tests vacuum and electrical components and connections of fuel system. N-AV111-D-14
- 5.2.A Determines needed repair of mechanical and electrical fuel pumps and pump control systems, including pressure regulators, based on inspection and testing. N-AV111-D-5
- 5.2.B Diagnoses hot or cold no starting or hard starting on vehicle with fuel injection fuel system. N-AV111-D-1, N-AV111-D-2
- 5.2.C Diagnoses fuel-system related problems on vehicle with fuel-injection fuel system, including: N-AV111-D-1, N-AV111-D-2
 - poor driveability
 - incorrect idle speed or poor idle,
 - flooding,
 - hesitation,
 - surging,
 - engine misfire,
 - power loss,
 - stalling,
 - poor mileage, and

- dieseling
- 5.3.A Replaces fuel injectors, filters, lines, fittings, and hoses as needed. N-AV111-D-3, N-AV111-D-6
- 5.3.B Repairs mechanical and electrical fuel pumps and pump control systems including pressure regulators. N-AV111-D-5
- 5.3.C Adjusts or replaces the following as needed:
 - fuel pressure regulation system components N-AV111-D-7 and
 - cold enrichment system components. N-AV111-D-8
- 5.3.D Adjusts idle speed and fuel mixture. N-AV111-D-13
- 5.3.E Cleans and reinstalls throttle body and adjusts related linkages. N-AV111-D-9
- 5.3.F Repairs or replaces the following:
 - throttle body mounting plates, N-AV111-D-11
 - air induction and filtration system, N-AV111-D-11
 - intake manifold, N-AV111-D-11
 - gaskets, N-AV111-D-11 and
 - vacuum and electrical components and connections of fuel system. N-AV111-D-H

SAMPLE PERFORMANCE TASKS

- Inspect and change fuel filter.
- Check fuel pressure and quantity against manufacturer's specifications.
- Adjust idle speed.
- Replace fuel injectors.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 6.0

Students will properly test, diagnose, service, and repair emission systems.

LEARNING EXPECTATIONS

The student will:

- 6.1 Comply with state and federal regulations related to exhaust emissions.
- 6.2 Inspect and test emission systems and components.
- 6.3 Diagnose fuel emission system problems and determine necessary action.
- 6.4 Service and repair emission systems and components.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1.A Locates, interprets, and assesses the implications of the Clean Air Act Amendment for automotive exhaust emission systems service and repair. A-A8-4-CLO
- 6.1.B Interprets the OBD II (On-Board Diagnostic Systems) provision of the Clean Air Act Amendment. A-A8-4-CLO
- 6.1.C Records information related to an exhaust emission inspection. N-AV111-A-10
- 6.2.A Inspects exhaust manifold, exhaust pipes, muffler, catalytic converter, resonator, tail pipe, and heat shield. N-AV111-D-15
- 6.2.B Tests the operation of turbocharger/supercharger systems.
- 6.2.C Inspects and tests the following:
 - positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; N-AV111-E-1.2
 - valve, valve manifold, and exhaust passages of exhaust gas recirculation (EGR) systems; N-AV111-E-2.2
 - vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems. N-AV111-E-2.3
 - electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; N-AV111-E-2.4
 - mechanical components of secondary air injection systems; N-AV222-E-3.2
 - electrical/electronically-operated components and circuits of air injection systems; N-AV111-E-3.3
 - components of catalytic converter systems; N-AV222-E-3.4
 - components and hoses of evaporative emissions control system; N-AV222-E-6.2
 - components of early fuel evaporation control system; N-AV111-E-5.2 and
 - components of intake air temperature control system. N-AV111-E-4.2
- 6.2.E Prepares 4- or 6-gas analyzer, inspects and prepares vehicle for test, and obtains exhaust readings. N-AV111-A-10

- 6.3.A Diagnoses oil leaks and emissions and driveability problems resulting from failure of the positive crankcase ventilation (PCV) system and determines necessary action. N-AV111-E-1.1
- 6.3.B Diagnoses emissions/driveability problems caused by failure of the:
 - exhaust gas recirculation (EGR) system, N-AV111-E-2.1
 - secondary air injection system, N-AV111-E-3.1
 - catalytic converter system, N-AV111-E-3.1
 - early fuel evaporation control system, N-AV111-E-6.1
 - PCV and evaporative emission control system, N-AV111-E-5.1 or
 - intake air temperature control system. N-AV111-E-4.1
- 6.3.C Interprets 4- or 6-gas analyzer readings and determines necessary action. N-AV111-A-10
- 6.3.D Diagnoses unusual exhaust color, odor, and sound; determines necessary action. N-AV111-A-4
- 6.3.F Determines action indicated by test of the turbocharger/supercharger system.
- 6.4.A Performs necessary adjustment, service, or repair to the following:
 - turbocharger/supercharger systems;
 - positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; N-AV111-E-1.2
 - valve, valve manifold, and exhaust passages of exhaust gas recirculation (EGR) systems; N-AV111-A-2.2
 - vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; N-AV111-A-2.3 and
 - electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems. N-AV111-A-2.4
- 6.4.B Performs necessary service or repair to components of the following systems:
 - secondary air injection systems (mechanical components), N-AV111-A-3.2
 - air injection systems (electrical/electronically-operated components and circuits), N-AV111-A-3.3
 - catalytic converter system, N-AV111-A-3.4
 - evaporative emissions control system, N-AV111-A-5.2
 - early fuel evaporation control system, N-AV111-A-6.2 and
 - intake air temperature control system. N-AV111-A-4.2

SAMPLE PERFORMANCE TASKS

- Record information drawn from an exhaust emission inspection.
- Diagnose problem with and make needed repair to catalytic converter system.
- Replace exhaust manifold.
- Replace EGR (exhaust gas re-circulation) system filters or hoses.
- Using case scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 7.0

Students will properly test, diagnose, service, and repair ignition systems.

LEARNING EXPECTATIONS

The student will:

- 7.1 Inspect and test ignition systems and components.
- 7.2 Diagnose ignition system problems and determine necessary action.
- 7.3 Service and repair ignition systems and components.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1.A Inspects and tests ignition primary and secondary circuit wiring and components, including coils, triggers, sensors, and modules. N-AV111-C-3, N-AV111-C-5
- 7.1.B Inspects and tests distributor. N-AV111-C-4
- 7.1.C Checks ignition system timing and timing advance/retard. N-AV111-C-7
- 7.1.D Inspects and tests ignition control module. N-AV111-C-9
- 7.2.A Diagnoses no-starting, driveability, and emissions concerns on vehicles with electronic ignition (EI/DIS) (distributorless) systems; determines necessary action. N-AV111-C-1
- 7.2.B Diagnoses no-starting, driveability, and emissions concerns on vehicles with distributor ignition (DI) systems; determines necessary action. N-AV111-C-2
- 7.3.A Repairs or replaces ignition primary and secondary circuit wiring and components including coils, triggers, sensors, and modules. N-AV111-C-3, N-AV111-C-5
- 7.3.B Repairs or replaces distributor. N-AV111-C-4
- 7.3.C Adjusts ignition system timing and timing advance/retard. N-AV111-C-7
- 7.3.D Repair or replaces ignition control module. N-AV111-C-9

SAMPLE PERFORMANCE TASKS

- Repair damaged distributor.
- Diagnose and adjust advanced ignition system timing.
- Using case scenarios, follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 8.0

Students will properly test, diagnose, service, and replace computerized engine controls.

LEARNING EXPECTATIONS

The student will:

- 8.1 Analyze information and data pertinent to computerized engine controls.
- 8.2 Inspect and test computerized engine control systems and components.
- 8.3 Diagnose computerized engine control problems and determine necessary action.
- 8.4 Service or replace computerized engine controls systems and components.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 8.1.A Accesses and uses electronic service information (ESI) for diagnosis. N-AV111-B-7
- 8.1.B Locates and interprets vehicle and major component identification numbers (vehicle identification number, vehicle certification labels, and calibration decals). N-AV111-B-8
- 8.1.C Retrieves and records active and stored OBD (On-Board Diagnostic) I and II diagnostic trouble codes; clears codes. N-AV111-B-1, N-AV111-B-2
- 8.2.A Inspects and tests computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits. N-AV111-B-5
- 8.2.B Obtains and interprets digital multimeter (DMM) readings. N-AV111-B-6
- 8.2.C Inspects and tests power and ground circuits and connections. N-AV111-B-9
- 8.3.A Diagnoses the cause of emissions or driveability concerns resulting from failure of computerized engine controls with stored diagnostic trouble codes; determines necessary action. N-AV111-B-3
- 8.3.B Diagnoses emissions or driveability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes; determines necessary action. N-AV111-B-4
- 8.3.C Diagnoses driveability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, and similar systems); determines necessary action. N-AV111-B-11
- 8.4.A Practices recommended precautions when handling static sensitive devices. N-AV111-B-10
- 8.4.B Services or replaces computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits. N-AV111-B-5
- 8.4.C Services or replaces power and ground circuits and connections. N-AV111-B-9
- 8.4.D Performs service indicated by failure of computerized engine controls with no stored diagnostic trouble codes. N-AV111-B-4

- 8.4.E Performs service indicated by failures of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, and similar systems). N-AV111-B-11

SAMPLE PERFORMANCE TASKS

- Replace computerized engine control system sensor.
- Retrieve stored OBD (On-Board Diagnostic) I and II diagnostic trouble codes.
- Access electronic service information (ESI) for a given vehicle and use data for diagnosis.
- Read a digital multimeter (DMM).
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Communication Skills, Teamwork Skills, Computer Skills, Reading and Writing Skills, Language Arts, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), National Institute for Automotive Service Excellence, National Automotive Technician Education Foundation, SkillsUSA-VICA, AYES Curriculum, Occupational Safety and Health Administration (OSHA).

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 9.0

Students will demonstrate communication skills required in the automotive service industry.

LEARNING EXPECTATIONS

The student will:

- 9.1 Communicate and comprehend oral and written information typically occurring in engine performance service.
- 9.2 Solve engine performance problems and make decisions using a logical process.
- 9.3 Use teamwork skills to accomplish goals, solve problems, and manage conflict within groups.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 9.1.A Interprets and uses written information in common job formats, such as tables, charts, and reference materials, manuals, and manufacturer referring to engine performance.
- 9.1.B Interprets and uses graphical information such as blueprints, electrical schematics, process control schematics, automotive flow diagrams, and other automotive diagrams referring to engine performance.
- 9.1.C Uses electronic resources to obtain service and other information concerning engine performance.
- 9.1.D Analyzes information obtained from various sources to determine a diagnostic approach.
- 9.1.E Communicates clearly and appropriately in oral and written form.
- 9.1.F Interprets an automotive repair order.
- 9.2.A Develops a hypothesis regarding the cause of an engine performance problem.
- 9.2.B Tests the hypothesis to determine the solution to the engine performance problem.
- 9.2.C Creates, evaluates, and revises as needed a plan to resolve an engine performance problem.
- 9.2.D Implements strategy based diagnostic procedure by verifying the complaint, defining the problem, isolating the problem, validating the problem, making repairs, and testing the repairs in an automotive engine.
- 9.3.A Serves in each of the functional roles of a team.
- 9.3.B Resolves conflicts within a group.
- 9.3.C Demonstrates appropriate and positive examples of giving and accepting criticism.
- 9.3.D Modifies behavior or revises work based on appropriate criticism.
- 9.3.E Solves problems in cooperation with other members of a group.
- 9.3.F Evaluates the role of the engine performance technician within the organizational system of a dealership or fleet shop.

SAMPLE PERFORMANCE TASKS

- Complete an automotive repair order and calculate salary based on manufacture labor operation time.
- Use reference materials to determine procedures for diagnosing and testing engines.
- Work as a team member to develop a diagnostic strategy.
- Use blueprints and diagrams to execute a task.

INTEGRATION LINKAGES

Communication Skills, Teamwork Skills, Computer Skills, Reading and Writing Skills, Language Arts, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum.

AUTOMOTIVE: ENGINE PERFORMANCE

STANDARD 10.0

Students will demonstrate interpersonal and employability skills required in the automotive services industry.

LEARNING EXPECTATIONS

The student will:

- 10.1 Evaluate career goals and establish long-term goals.
- 10.2 Demonstrate attitudes conducive to workplace success.
- 10.3 Maintain a neat and orderly work area.
- 10.4 Assess implications of diversity for communities, workplaces, and manufacturers.
- 10.5 Develop personal financial skills.
- 10.6 Develop individual time management and work sequencing skills relating to engine performance procedures.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 10.1.A Explores opportunities for advanced training.
- 10.1.B Assesses the potential impact of an individual's educational level on an organizational system.
- 10.1.C Infers the relationship between work ethics, education, and personal job success.
- 10.2.A Judges which attitudes and behaviors are conducive to success.
- 10.2.B Models customer service skills.
- 10.3.A Keeps work area organized and free from clutter according to NATEF and OSHA standards.
- 10.3.B Deduces the correlation between a clean orderly work environment and successful and efficient job performance and earnings.
- 10.4.A Points out potential benefits and problems that may arise from diversity in the automotive service workplace, including manufacturer diversity.
- 10.4.B Devises solutions to problems arising from gender, cultural, racial, and religious diversity.
- 10.5.A Develops a personal budget.
- 10.5.B Sets personal financial goals.
- 10.6 Displays time management and work sequencing skills in class assignments and work assignments.

SAMPLE PERFORMANCE TASKS

- Maintain an orderly work area.
- Consistently arrive at class on time.
- Participate in an internship in a dealership or fleet shop.
- Resolve an interpersonal conflict in the classroom.

INTEGRATION LINKAGES

Math, Science, Communication Skills, Teamwork Skills, Reading Skills, Leadership Skills, Secretary's Commission on Achieving Necessary Skills, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), SkillsUSA-VICA, AYES Curriculum.

AUTOMOTIVE: ENGINE PERFORMANCE

SAMPLING OF AVAILABLE RESOURCES

A8 Automotive Engine Performance Course, AYES Curriculum, AYES Corporation,
www.ayes.org

A8 Engine Performance, CD-ROM, Interactive Computer Based Training, DVP/CDX,
1-888-873-2239

Curriculum Integrator, CORD Communications, Waco, Texas 1998

Engine Performance Specialist, Service Series Curriculum and Instructional Materials Center
(CIMC), Oklahoma Department of Vocational and Technical Education

Module 3 Engine Performance, Instructional Materials Laboratory (IML), University of Missouri

Today's Technician Automotive Engine Performance, Knowles, Delmar Publishing, 1999

1999 Automobile Task List, National Automotive Technicians Education Foundation (NATEF),
www.natef.org